DDT AND PCB IN DATED SEDIMENTS

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In past work, we have identified the levels of chlorinated hydrocarbon contamination in the sediments around southern California municipal wastewater outfalls. In the program described here, we are examining historical levels of DDT and PCB compounds in sediments many miles distant from the known point sources. Samples of layered ("varved") sediments from the anaerobic Santa Barbara Basin were collected and dated by Andrew Soutar of Scripps Institution of Oceanography; the samples were then analyzed for DDT and PCB by electron capture gas chromatography in the laboratory of Dr. Robert Risebrough, University of California, Berkeley, in collaboration with the Project. The results are summarized in Figures 1 and 2.

These data suggest that deposition of measurable PCB began in about 1945, and that DDT compounds first appeared in sediments deposited in about 1952. Concentrations of both substances increased progressively through 1967, when corresponding deposition rates were approximately 10 4 and 2 x 10 4 g/sq m/yr, respectively. These figures may be assumed to be minimum estimates of the 1967 inputs of these compounds into the overlying waters. The deposition rate for DDT residues is more than twice the rate reached in British rainfall during 1966 to 1967. Because global production values indicate that the British rainout concentrations must represent a maximum for the world wide average onto ocean waters, it appears that the majority of the DDT compounds entering the Santa Barbara Basin during 1967 must have come from local sources.

If the deposition rate of DDT compounds to Santa Barbara Basin in 1967 is typical of that in other areas off southern California, the total deposition over an area 400 km x 100 km would be about 8 metric tons per year. This figure exceeds the estimate of 2 metric tons of DDT compounds entering San Francisco Bay from the drainage waters of the principal agricultural areas of California in 1967, and is much larger than the 0.1 metric tons carried by southern California runoff in 1971 72. As is shown elsewhere in this report, the estimated yearly input of DDT compounds from the atmosphere into southern California coastal waters in 1973 74, when the use of this pesticide in California had ceased, was 0.8 metric tons. Input rates via surface runoff and atmospheric fallout during the mid 60's, when local use of UDT was extensive, may have been considerably larger. Also it should be noted that chlorinated hydrocarbons generally are attached to fine particulates of the type that eventually reach sedimentation basins such as the one studied. Thus, extrapolation of the Santa Barbara Basin results to the entire coastal zone may overestimate the average coastal deposition rate for 1967.

Substantially higher concentrations of DDT compounds are present in sediments adjacent to the Whites Point outfalls. Inputs to the sea from that source in 1971 amounted to 19 metric tons. In addition, an estimated 10 metric tons of PCB compounds were discharged into coastal waters from the major municipal wastewater outfalls in Los Angeles and Orange Counties during 1971. A subsurface current, moving northward from the Los Angeles area at a depth of approximately 200 meters through the Channel Islands, might therefore also be a source of the DDT and PCB compounds in the Santa Barbara Basin sediments.

Details of this study are published in Science (vol. 184 pp. 1197 99). We are now analyzing sediments deposited since 1967 to compare these deposition rates with recent inputs.

FIGURES

Figure 1.
Concentration of p,p' DDE in dated ocean bottom sediments from Santa Barbara Basin

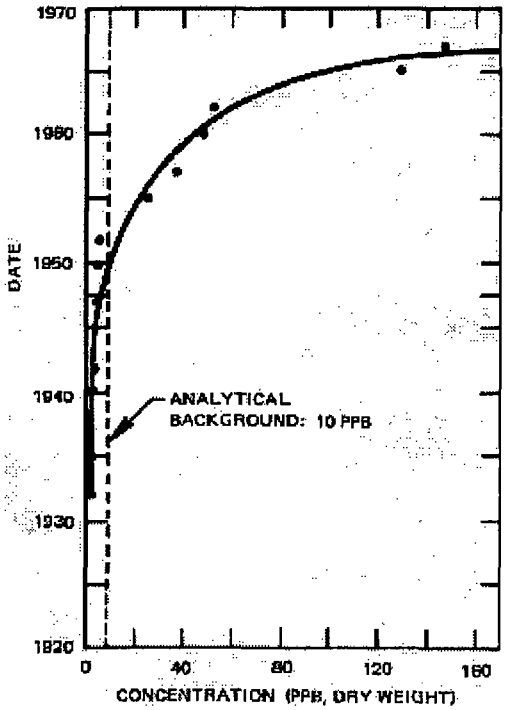

Figure 2.
Concentration of PCB 1254 in dated ocean bottom sediments from Santa Barbara Basin